

CHROMOSOME NUMBER DETERMINATIONS IN
FAM. COMPOSITAE, TRIBE ASTEREAEE. V.
EASTERN NORTH AMERICAN TAXA

JOHN C. SEMPLE, JIE ZHANG AND CHUNSHENG XIANG

ABSTRACT

Chromosome numbers are reported for 333 individuals of 109 taxa and two interspecific hybrids from among 11 genera. The vast majority of the reports are for *Aster sensu lato* and *Solidago*. Many counts confirm previous reports for the taxa; approximately one third of the counts are first reports for a taxon, or ploidy level of a taxon, in one or more of the 26 states of the eastern United States and one Canadian province sampled. The cytogeography and cytotaxonomy of the *Aster pilosus*, *Solidago stricta* and *S. uliginosa* complexes are discussed. The following first reports are included: *Aster attenuatus*, $2n = 48$; *A. surculosus*, $2n = 36$; *Solidago latissimifolia*, $2n = 18_{II}$, $2n = 36$, $2n = 27_{II}$, $2n = 54$; *S. patula* var. *strictula*, $2n = 9_{II}$; *S. pulchra*, $2n = 18_{II}$.

Key Words: Compositae, Astereae, chromosome numbers, *Aster*, *Boltonia*, *Coryza*, *Croptilon*, *Chrysopsis*, *Euthamia*, *Gutierrezia*, *Heterotheca*, *Pityopsis*, *Solidago*, *Virgulus*, cytogeography, Canada, United States

INTRODUCTION

This is the fifth in a continuing series of reports by our laboratory and collaborators on chromosome numbers in the tribe Astereae (Semple, 1985; Semple and Chmielewski, 1987; Semple, Chmielewski and Lane, 1989; Semple, Chmielewski and Xiang, 1992). Determining the distribution patterns of cytotypes requires numerous counts from the range of a taxon. The counts listed in this paper are reported as further contributions to such studies. In this paper, our focus is on taxa native to the eastern and central United States and adjacent Canada.

MATERIALS AND METHODS

Meiotic counts were made from pollen mother cells dissected from buds fixed in the field in 3:1/EtOH : glacial acetic acid and subsequently stored under refrigeration in 70% EtOH. Mitotic counts were made from root tip cells taken from transplanted wild rootstocks or from seedlings grown from achenes collected in the wild. Root tips were pretreated in 0.01% colchicine or saturated paradichlorobenzene (PDB) for 2-3 hr., fixed in either Modified

Carnoy's Fixative (4:3:1/chloroform : EtOH : glacial acetic acid) or Acetic Alcohol Fixative (3:1/EtOH : glacial acetic acid) and hydrolyzed in 1 N HCl for 30 min. at 60°C before squashing. Both anther sacs containing pollen mother cells and meristematic root tips were squashed in 1% acetic orcein, and counts of chromosomes were made from freshly prepared material. Permanent slides were made in most cases as described by Semple, Brammall and Chmielewski (1981) and remain in Semple's possession.

All counts were made from sporophyte tissue cells and are reported as " $2n =$." Those counts made from late prophase (diplotene and diakinesis) and first metaphase in pollen mother cells undergoing meiosis are followed by "_{II}" indicating that pairs of chromosomes were counted, e.g., $2n = 18_{II}$. Many of the taxa studied include polyploids and could be indicated by additional notation, e.g., $2n = 4x = 32$. However, since nearly all, if not all of these cytotypes appear to have undergone diploidization, counts for them are reported without indicating ploidy level.

Vouchers for all counts are deposited in WAT with duplicates distributed to various other herbaria. Identifications were made by Semple. In some cases, the voucher specimens did not agree with published descriptions in one or more minor traits, such as the amount of pubescence or floret color; these cases are indicated by the qualifier "aff." in Table 1.

RESULTS AND DISCUSSION

Chromosome number determinations from 333 individuals representing 109 taxa and two interspecific hybrids from among 11 genera are reported in Table 1. All location and voucher data are published here for the first time. Populations were sampled in one province in Canada and in 26 states in the United States. In total, 308 of these reports are for asters and goldenrods (*Aster*, *Virgulus*, *Solidago* and *Euthamia*). Two-thirds of the counts confirm previous reports for the taxa and most are presented without comment. Included in Table 1 are the following first reports for these taxa: *Aster attenuatus* Lindl., $2n = 48$ (one population) from Texas; *A. surculosus* Michx., $2n = 36$ (one population) from North Carolina; *Solidago latissimifolia* Mill. (one population each), $2n = 18_{II}$ from South Carolina, $2n = 36$ from Massachusetts, $2n = 27_{II}$ from Massachusetts and Rhode Island, $2n = 54$ from Mas-

Table 1. Chromosome number determinations of Astereae from Canada and the United States, arranged alphabetically. *Ah* = Tufail Ahmed; *Ch* = J. G. Chmielewski; *S* = J. C. Semple; *Su* = Bambang Agus Suropto; *Xg* = ChunSheng Xiang. When voucher specimens did not fit a published taxon description in one or more minor traits, the qualifier "aff." is used. State highway numbers are indicated by the standard postal code abbreviation for the state followed by the number. ¹ First report for the taxon; ² first report(s) for the taxon or ploidy level for the particular province or state.

-
- Aster acuminatus* Michx. $2n = 9_{II}$. **Maine.** York Co.: Lyman, ME-111 0.1 km E of ME-35, *S* & *Su* 9587.
- A. anomalus* Englemann in Torr. & Gray. $2n = 16$. **Arkansas.**² Carrol Co.: US-62 W of Berryville, 6.9 km E of AR-23, *S* & *Su* 9950. **Illinois.** Union Co.: Bald Knob Rd., woods, *S* & *Su* 9877.
- A. asteroides* (L.) MacMillan (synonym: *A. paternus* Cronq.) $2n = 18$. **North Carolina.** Cherokee Co.: W of Ranger, US-64 7.8 km W of US-129, *S* & *Jeff Semple* 10353 (2 plants).
- A. attenuatus* Lindl. in Hook.¹ $2n = 48$. **Texas.** Jasper Co.: E of Woodville, US-190 13.5 km E of US-69, *S* & *Su* 10055.
- A. avitus* Alex. $2n = 18$. **Georgia.** Dekalb Co.: base of Stone Mt. near access rd to top of mountain, *S* & *Jeff Semple* 10346.
- A. borealis* (Torr. & Gray) Prov. $2n = 64$. **Ontario.** Kenora Dist.: Peawanuck (S of old Winisk), *Clements s.n.*
- A. chlorolepis* Burgess in Small. $2n = 36$. **North Carolina.** Yancey Co.: Mt. Mitchell, midway along rd to park, *S* & *Su* 9684.
- A. ciliolatus* Lindl. $2n = 48$. **Ontario.** Kenora Dist.: Peawanuck (S of old Winisk), *Clements s.n.*
- A. cordifolius* L. $2n = 16$. **Illinois.** Union Co.: Trail of Tears State For., *S* & *Su* 9882. **Kentucky.** Allen Co.: US-31 a few mi. S of Petroleum, *S* & *Ch* 9110. $2n = 32$. **Kentucky.** Adair Co.: NW of Toria, Cumberland Pkwy (MP38.1), *S* & *Su* 9447. Pulaski Co.: KY-1392 ca. 10 km S of Livingston, bluff of Rockcastle R., *S* & *Su* 9603. **Oklahoma.**² Flore Co.: US-59 just N of Ouachita Nat'l For. boundary, *S* & *Su* 9985.
- A. aff. cordifolius* L. × *A. pilosus* Willd. $2n = 32$. **Ontario.** Waterloo Co.: Wellesley Twp, *S* & *Ch* 9097A.
- A. depauperatus* (Porter) Fern. $2n = 16$. **North Carolina.** Granville Co.: NE of Butner, along power line right-of-way, *S* & *Su* 9724.
- A. divaricatus* L. $2n = 9_{II}$. **Pennsylvania.** Perry Co.: PA-74 3 km NW of Ickesberg, *S* & *Su* 9490. $2n = 18$. **Massachusetts.** Bristol Co.: N of Somerset along Segreganset Estuary, *S* 9183.
- A. drummondii* Lindl. $2n = 16$. **Arkansas.** Carrol Co.: N edge of Berryville, AR-21, corner of Julie St. and Standley Ave. NE, *S* & *Su* 9948. **Louisiana.**² Caddo Parish: LA-2 8.0 km E of Vivian (LA-1), *S* & *Su* 10031. **Texas.**² Lamar Co.: Brackeen Cemetery Rd. off TX-19, *S* & *Su* 10003. Newton Co.: NE of Burkeville, TX-63 2.5 km W of Sabine R., *S* & *Su* 10049. $2n = 32$. **Illinois.** Kankakee Co.: NW of Bradley, Kankakee State Park, along Rock R., *S* & *Su* 9867. St. Clair Co.: Fairview Heights, community park, *S* & *Su* 9406. **Mississippi.**² Adams Co.: SE of Natches, Fire Tower Rd. just E of US-91, *S*
-

Table 1. Continued.

- & *Su* 10087. **Texas.**² Anderson Co.: US-84 17.6 km E of Palestine city limits (Loope Rd-56), *S* & *Su* 10016.
- A. dumosus* L. $2n = 8_{II}$. **North Carolina.** Bertie Co.: SE of Bertie, NC-308 9.8 km SE of US-17, *S* & *Su* 9742. Yadkin Co.: WSW of Yadkinville, US-421 ca. 1 km E of US-21, *S* & *Su* 9708 & *S* & *Su* 9709. $2n = 16$. **Kentucky.** Pulaski Co.: KY-1392 ca. 10 km S of Livingston, bluff of Rockcastle R., *S* & *Su* 9604. **Louisiana.** Concordia Parish, W of Ferriday, US-84 6 km W of LA-15, vicinity of picnic area, *S* & *Su* 10069. **Massachusetts.** Essex Co.: N of Newbury, by airport, ca. 1.5 km W of Plum Is. R., *S* & *Su* 9574. **Mississippi.** Amite Co.: NE of Liberty, Holmes Rd. 6.7 km SE of MS-570, *S* & *Su* 10102. $2n = 32$. **Arkansas.** Franklin Co.: N of Ozark, AR-23 just S of I-40, *S* & *Su* 9966. Sebastian Co.: AR-28 4.6 km E of Cauthron, 14 km W of US-71, *S* & *Su* 9980. **Louisiana.** Vernon Parish: US-171 3.4 km N of Anacoco (LA-111), *S* & *Su* 10041. **Oklahoma.**² McCurtain Co.: US-70 3.5 km E of Valiant, W of Millerton, *S* & *Su* 9995. **South Carolina.** Clarendon Co.: US-521 1.1 km SE of Wilson, *S* & *Su* 9784. **Texas.**² Newton Co.: NE of Burkeville, TX-63 2.5 km W of Sabine R., *S* & *Su* 10048.
- A. gracilis* Nutt. $2n = 9_{II}$. **New Jersey.** Burlington Co.: N of Chatsworth, Co. Rd.-563 0.9 km S of NJ-72, *S* 10365; S of Chatworth, local road to cranberry bog, *S* 10369. Ocean Co.: W of Barnegat, Co. Rd.-554 2.4 km W of Garden State Parkway, *S* & *Su* 9516.
- A. hemisphaericus* Alex. in Small. $2n = 18$. **Mississippi.** Franklin Co.: US-98 just E of MS-570, *S* & *Su* 10101.
- A. laevis* L. var. *laevis* × *A. lanceolatus* Willd. ssp. *lanceolatus* var. *lanceolatus*. $2n = 48$. **Ontario.** Kent Co.: Hwy-3, Port Crewe, *S* & *Ch* 9138.
- A. lanceolatus* Willd. ssp. *lanceolatus* var. *hirsuticaulis* Semple & Chmielewski. $2n = 32$. **Wisconsin.** Douglas Co.: US-2 E of Maple, *S* 9047-2.
- A. lanceolatus* Willd. ssp. *lanceolatus* var. *interior* (Wieg.) Semple & Chmielewski. $2n = 48$. **Arkansas.**² Logan Co.: SW of Booneville, AR-23 2.2 km E of Carolan Cemetery, *S* & *Su* 9976. **Illinois.** White Co.: S of Norris City, junction of IL-1 and US-45, *S* & *Su* 9423. $2n = 64$. **Kentucky.**² Webster Co.: KY-109 1.7 km W of Clay, *S* & *Su* 9428.
- A. lanceolatus* Willd. ssp. *lanceolatus* var. *latifolius* Semple & Chmielewski. $2n = 64$. **Illinois.** Franklin Co.: IL-149 1.7 km W of Zeigler (IL-148). *S* & *Su* 9875. **Indiana.** Putnam Co.: SE of Cloverdale, IN-42 4.1 km W of US-231, *S* & *Su* 9401. **Kentucky.**² Robertson Co.: KY-617 0.5 km W of Piqua, banks of Bluelick R., *S* & *Su* 9593. Webster Co.: KY-109 1.7 km W of Clay, *S* & *Su* 9427.
- A. lanceolatus* Willd. ssp. *lanceolatus* aff. var. *latifolius* Semple & Chmielewski. $2n = 64$. **Alabama.**² Montgomery Co.: SE of Montgomery, US-321 0.7 km SE of US-82 *S* & *Su* 10155. The rays are blue and the phyllaries are less graduated than typical for the variety).
- A. lateriflorus* (L.) Britt. $2n = 16$. **Missouri.** Carter Co.: US-60 1.8 km E of Van Buren *S* & *Su* 9907. **Oklahoma.** Flore Co.: US-59 just N of Ouachita Nat'l For. boundary, river bank, *S* & *Su* 9984. $2n = 32$. **Alabama.** Dale Co.: E of Clayhatchee, US-84 at Little Choctawhatchee R., *S* & *Su* 10152. **Illinois.**

Table 1. Continued.

- Hamilton Co.: IL-142 1 km SE of Dahlgreen, *S & Su* 9419. **Kentucky.** Estill Co.: KY-52 E of Ravenna, *S & Su* 9457. Hopkins Co.: KY-109 1 km N of Charleston, *S & Su* 9430. Pulaski Co.: KY-1392 ca. 10 km S of Livingston, bluff slope of Rockcastle R., *S & Su* 9601, **Missouri.** Douglas Co.: MO-14 at Twin Bridges (MO-181), along N. Fork of White R., *S & Su* 9927. **Tennessee.** Montgomery Co.: US-79 0.5 km S of Kentucky state line, *S & Su* 9435. **Texas.** Rusk Co.: US-84 6.4 km E of Reklaw, *S & Su* 10023.
- A. linariifolius* L. $2n = 9_{II}$. **Louisiana.** Rapides Parish: N of Forest Hill, LA-112 2.1 km W of US-165, *S & Su* 10090. **Maine.** Sagadahoc Co.: NW of Popham Beach, junction of ME-209 and ME-216, *S* 10378. **Massachusetts.** Barnstable Co.: Harwich, Queen Anne Rd 2 km NE of Old Chatham Rd., *S & Su* 9559. **New Jersey.**² Atlantic Co.: US-40 5.6 km W of Mays Landing (NJ-42), *S & Su* 9504. **South Carolina.** Berkeley Co.: SC-45 ca. 5 km E of St. Stephen, Francis Marion Nat'l For., *S & Su* 9794.
- A. nemoralis* Ait. $2n = 9_{II}$. **Maine.** Sagadahoc Co.: W Popham Beach, ME-209 2 km E of ME-216, *S* 10380.
- A. novi-belgii* L. $2n = 48$. **Maine.** York Co.: Wells, vicinity of Municipal Offices, *S & Su* 9581.
- A. ontarionis* Wieg. $2n = 32$. **Tennessee.** Marshall Co.: Henry Horton State Park, *S & Ch* 9117. Montgomery Co.: NE of Clarkville, US-79 0.5 km S of Kentucky state line, *S & Su* 9436.
- A. oolentangiensis* Riddell. $2n = 32$. **Illinois.** St. Clair Co.; Fairview Heights, community park, *S & Su* 9407. **Missouri.** Oregon Co.: MO-19 16.6 km S of US-60, N of Greer, *S & Su* 9911. Wayne Co.: Co. Rd.-F 0.1 km E of US-67, 7.8 km S of Greenville, *S & Su* 9894. **Oklahoma.** McCurtain Co.: US-259 20.9 km N of Broken Bow, *S & Su* 9990.
- A. aff. parviceps* (Burgess) Mackenzie & Bush. [See text for discussion of these collections.] $2n = 32$. **Missouri.** Washington Co.: MO-8 6.6 km W of Potosi, *S, Su & Ah* 9393.
- A. aff. pilosus* Willd. var. *pringlei* (A. Gray) Blake. [See text for discussion of these collections.] $2n = 48$. **Missouri.**² Oregon Co.: N of Greer, MO-19 16.6 km S of US-60, Mark Twain Nat'l For., vicinity of For. Rd.-3174, *S & Su* 9912. Taney Co.: MO-76 12.6 km W of county line, cedar glade, *S & Su* 9938. Wayne Co.: Co. Rd.-F 0.1 km E of US-67, 7.8 km S of Greenville, *S & Su* 9892.
- A. pilosus* Willd. var. *pilosus*. $2n = 32$. **Ontario.** Essex Co.: Colchester N. Twp, Essex-12 5 km SW of Gesto, SW of Canard R., *S & Ch* 9145. **Arkansas.** Madison Co.: S of Eureka Spring, AR-23 1.8 km S of county line, *S & Su* 9955. **Illinois.** 7.5 km E of McLeansboro at Co. Rd.-1400E, *S & Su* 9422. **Kentucky.** Nicholas Co.: Bluelick Battlefield State Park, *S & Su* 9596. Warren Co.: US-68 at Logan Co. line, vicinity of quarry, *S & Su* 9441. **North Carolina.** Avery Co.: E of Linville, top of Grandfather Mt., edge of parking lot, *S & Su* 9672. $2n = 48$. **Illinois.** Hamilton Co.: IL-142 1.0 km SE of Dahlgreen, *S & Su* 9417. **Oklahoma.**² McCurtain Co.: W of Millerton, US-70 3.5 km E of Valiant, *S & Su* 9994.
- A. pilosus* Willd. aff. var. *pringlei* (A. Gray) Blake. $2n = 48$. **Massachusetts.** Barnstable Co.: East Brewster, along Bike Trail W of Nickerson State Park,

Table 1. Continued.

- near MA-6A, *S & Su* 9551. (The plant is more hairy than typical but not as hairy as var. *pilosus*.)
- A. praealtus* Poir. var. *praealtus*. $2n = 32$. **Mississippi**. Amite Co.: NE of Liberty, Holms Rd., *S & Su* 10105. **Missouri**. Greer Co.: SE of Walnut Grove, MO-123 at Farm Rd-56, *S & Su* 9946. **Oklahoma**. McCurtain Co.: US-70 E edge of Idabel, *S & Su* 9993. $2n = 48$. **Texas**. Lamar Co.: US-271 S of Powderly, N of Paris, N of Loop-Rd.-287, *S & Su* 9999.
- A. prenanthoides* Muhl. $2n = 32$. **Kentucky**. Laurel Co.: along Rockcastle R. above mouth of Blair Branch Creek, *S & Su* 9854. Menifee Co.: Boone Nat'l For., KY-715 along river, *S & Su* 9465. **Tennessee**.² Unicoi Co.: E of Unicoi, TN-107 5.2 km E of TN-173, *S & Su* 9632.
- A. priceae* Britt. $2n = 64$. **Kentucky**.² Logan Co.: Russellville, US-68 just N of US-431, glade, *S & Su* 9438. Warren Co.: US-68 at Logan County line, by quarry, *S & Su* 9440-1.
- A. puniceus* L. $2n = 16$. **Georgia**.² Rabun Co.: US-76 ca. 3 km W of Clayton, *S & Su* 9830. **Minnesota**. Pine Co.: MN-18 E of N end of Big Pine Lake, near county line, *S* 9069. **North Carolina**. Avery Co.: W of Linville, Grandfather Mt., near Black Rock Hiking Trail, *S & Su* 9673. **Tennessee**.² Unicoi Co.: E of Unicoi, TN-107 0.3 km W of NC state line, *S & Su* 9642.
- A. racemosus* Ell. [Specimens treated in most floras under the misapplied name *A. vimineus* Lam.] $2n = 8_{II}$. **North Carolina**. Chowan Co.: NC-37 just N of Albermarle Sound Causeway, *S & Su* 9747. $2n = 16$. **Alabama**.² Montgomery Co.: SE of Montgomery, US-231 0.7 km SE of US-82, *S & Su* 10156. Tuscaloosa Co.: US-82 2.4 km W of US-43, W of Northport, NW of Tuscaloosa, *S & Su* 10162. **Arkansas**. Washington Co.: US-71, rest area N of Brentwood, *S & Su* 9959. **Kentucky**.² Webster Co.: KY-109 1.7 km W of Clay, *S & Su* 9429. **Louisiana**.² East Feliciana Parish: S of Felps, LA-67 2.5 km S of LA-422, *S & Su* 10107. Red River Parish: N of Edgefield, LA-7 11.2 km S of county line, *S & Su* 10036. **Mississippi**. Franklin Co.: NW of Roxie, US-84 1.5 km W of MS-33, *S & Su* 10098. Monroe Co.: S of Becker, MS-25 0.9 km N of MS-8, *S & Su* 10167. **Missouri**.² Wayne Co.: Co. Rd.-F 0.1 km E of US-67, 7.8 km S of Greenville, *S & Su* 9895. **Texas**. Anderson Co.: US-84 17.6 km E of Palestine city limit (Loop Rd-56), *S & Su* 10017. Grimes Co.: TX-105 2.6 km W of Plantersville, *S & Su* 10064. San Jacinto Co.: TX-150 3.6 km E of Shepherd, *S & Su* 10062. $2n = 32$. **North Carolina**. Durham Co.: N of Durham, by Eno R., Penny's Head Nature Res., *S & Su* 9718.
- A. reticulatus* Pursh. $2n = 18$. **Florida**. Leon Co.: S of Bloxham, Appalachicola N.F., For. Rd.-320 just E of Co. Rd.-375 (T1S, R4W, Sec. 32), *S & Jeff Semple* 10342.
- A. retroflexus* Lindl. in DC. $2n = 48$. **North Carolina**. Mitchell Co.: NC-226 0.5 km E of Tennessee state line, *S & Su* 9648. Watauga Co.: W of Blowing Rock, *S & Su* 9681. **Tennessee**. Unicoi Co.: TN-107 17 km E of Unicoi, *S & Su* 9643.
- A. sericocarpoides* (Small) K. Schum. $2n = 18$. **South Carolina**.² Chesterfield Co.: US-1 just NE of entrance to Cheraw Fish Hatchery, *S & Su* 9780.
- A. shortii* Lindl. in Hook. $2n = 16$. **Illinois**. Kankakee Co.: NW of Bradley, Kankakee R. State Park, woods by Rock R., *S & Su* 9868. **Kentucky**. Adair

Table 1. Continued.

- Co.: NW of Toria, Cumberland Parkway (MP38.1) W of KY-80, *S & Su* 9449. $2n = 32$. **Indiana.** Putnam Co.: SE of Cloverdale, IN-42 4.1 km W of US-231, *S & Su* 9402. **Kentucky.** Christian Co.: KY-109 SE of Dawson Spring, Pennyrite For. State Park, *S & Su* 9433. Warren Co.: S of Alvaton, US-231 2.8 km S of Co. Rd.-961, *S & Ch* 9105.
- A. solidagineus* Michx. $2n = 18$. **North Carolina.** Cherokee Co.: US-64 7.8 km W of Ranger (US-129), *S & Jeff Semple* 10352 (3 plants).
- A. spectabilis* Ait. $2n = 36_{11}$. **Massachusetts.** Plymouth Co.: W of Cedarville, Long Pond Rd. 0.3 km N of Carters Bridge Rd., N of Great Herring Lake, *S & Su* 9567.
- A. subulatus* L. var. *subulatus*. $2n = 5_{11}$. **New Jersey.** Ocean Co.: Tuckerton, cedar marsh E of town center, *S & Su* 9525.
- A. surculosus* Michx.¹ $2n = 36$. **North Carolina.**² Cherokee Co.: SE of Ranger, US-19 2.35 km S of US-64, W of Ranger, *S & Jeff Semple* 10350.
- A. texanus* Burgess in Small. $2n = 32$. **Texas.** Grimes Co.: TX-105 2.6 km W of Plantersville, *S & Su* 10065.
- A. aff. texanus* Burgess in Small. $2n = 32$. **Texas.** Jasper Co.: US-190 at Farm Rd-256, W of TX-63, *S & Su* 10054.
- A. tortifolius* Michx. $2n = 9_{11}$. **South Carolina.** Jasper Co.: SC-652 14.9 km SE of Pineland, *S & Su* 9804.
- A. turbinellus* Lindl. $2n = ca. 96$. **Missouri.** Washington Co.: MO-8 6.6 km W of Potosi. *S, Su & Ah* 9392.
- A. umbellatus* Mill. var. *umbellatus*. $2n = 9_{11}$. **Connecticut.**² New London Co.: Waterford, Waterford Conservation Area, Nevins Brook, *S* 9191. **Massachusetts.**² Essex Co.: N of Newbury, ca. 1.5 km W of Plum Is. R., opposite airport, *S & Su* 9573.
- A. undulatus* L. $2n = 9_{11}$. **South Carolina.** Berkeley Co.: SC-45 ca. 5 km E of St. Stephen, Francis Marion Nat'l For., *S & Su* 9793. $2n = 32$. **Kentucky.** Adair Co.: NW of Toria, Cumberland Parkway (MP38.1) W of KY-80, *S & Su* 9448. **North Carolina.** Watauga Co.: US-421 at Wilkes Co. line, *S & Su* 9701.
- A. urophyllus* Lindl. in DC. $2n = 16$. **Arkansas.**² Carrol Co.: W of Berryville, US-62 6.9 km E of AR-23, *S & Su* 9949. **Minnesota.** Hennepin Co., Eden Prairie, Spring Rd. just W of county airport, *S et al.* 8851. **Missouri.** Carter Co.: between Hunter and Van Buren, gravel extension of MO-T 7.8 km SW of US-60, *S & Su* 9903. Hickory Co.: E of Wheatland, US-54 0.9 km E of Hicomo Picnic Area, *S & Su* 9943. Wayne Co.: E of Williamsville, MO-49 4.4 km E of Co. Rd-A, *S & Su* 9901.
- Boltonia asteroides* (L.) L'Her. var. *recognita* (Fern. & Griscom) Cronq. $2n = 18$. **Illinois.** Hamilton Co.: IL-142 1 km SE of Dahlgreen, *S & Su* 9415; IL-142 8.5 km SE of Dahlgreen, *S & Su* 9420.
- Conyza canadensis* (L.) Cronq. var. *canadensis*. $2n = 18$. **Ontario.** Waterloo Regional Mun.: Waterloo, University of Waterloo, north campus greenhouse, weed in pot, *S* 1038x.
- Croptilon divaricatum* (nut.) Raf. $2n = 4_{11}$. **North Carolina.** Pitt Co.: W of Bethel, US-64 0.2 km E of Edgecombe Co. line, *S & Su* 9736.

Table 1. Continued.

- Chrysopsis gossypina* (Michx.) Ell. ssp. *gossypina* f. *gossypina*. $2n = 9_{II}$. **North Carolina.** Pender Co.: Hampstead, NC-210 0.9 km W of US-17, *S & Su* 9758.
- C. gossypina* (Michx.) Ell. ssp. *gossypina* f. *trichophylla* (Nutt.) Semple. $2n = 9_{II}$. **North Carolina.**² Bladden Co.: NC-53 20 km SE of US-701, *S & Su* 9773.
- C. mariana* (L.) Ell. $2n = 12_{II}$. **New Jersey.** Atlantic Co.: US-40 5.6 km W of Mays Landing (Hwy-52), *S & Su* 9503. **Louisiana.** Beauregard Parish: LA-12 11.8 km W of Ragley (US-171), 1.4 km W of Gordon Fire Tower, *S & Su* 10089. **North Carolina.** Bertie Co.: SE of Bertie, NC-308 9.8 km SE of US-17, *S & Su* 9742. **South Carolina.** Colleton Co.: NW of Jacksonboro, NC-64 ca. 2.5 km NW of US-17, *S & Su* 9799.
- Euthamia leptcephala* (Torr. & Gray) Greene. $2n = 18$. **Texas.** Navarro Co.: W of Eureka, US-287 3.3 km W of Farm Rd.-637, *S & Su* 10010. Newton Co.: TX-63 2.5 km W of Sabine R., NE of Burkeville, *S & Su* 10050. Polk Co.: E of Livingstone, US-190 1.8 km E of Soda, 16.4 km E of TX-146, *S & Su* 10061.
- E. tenuifolia* (Pursh) Nutt. $2n = 18$. **North Carolina.** Franklin Co.: NC-56 4.2 km W of county line, *S & Su* 9731. **South Carolina.**² Hampton Co.: SC-68 11 km NW of Yemasee, *S & Su* 9802.
- Gutierrezia texana* (DC.) Torr. & Gray var. *texana*. $2n = 4_{II}$. **Texas.** Dallas Co.: N of Cedar Hill, Cedar Hill Rd. opposite lot No. 1110, RR right-of-way, *S & Su* 10008.
- Heterotheca camporum* (Greene) Shinnars var. *glandulissimum* Semple. $2n = 36$. **Alabama.**² Limestone Co.: Littleville, US-43 at N city limits, *S & Su* 10178. **Arkansas.** Carrol Co.: NE of Oak Grove, AR-21 just S of Blue Eye, *S & Su* 9947. **Missouri.**² Christian Co.: Ozark, MO-14 just E of US-65, *S & Su* 9939.
- H. subaxillaris* Lam. $2n = 9_{II}$. **New Jersey.**² Salem Co.: W of Malaga, NJ-55, *S & Su* 9498.
- Pityopsis falcata* (Pursh) Nutt. $2n = 9_{II}$. **Massachusetts.** Barnstable Co.: Cape Cod, East Brewster, by Bike Trail W of Nickerson State Park, near MA-6A, *S & Su* 9762.
- P. graminifolia* (Michx.) Nutt. var. *latifolia* (Fern.) Semple & Bowers. $2n = 18_{II}$. **North Carolina.** Chowan Co.: NC-37 just N of Albermarle Sound Causeway, SE of Edenton, *S & Su* 9746. Pender Co.: Hampstead, NC-210 ca. 4.1 km W of US-17, *S & Su* 9762.
- P. graminifolia* (Michx.) Nutt. var. *tenuifolia* (Torr.) Semple & Bowers. $2n = 9_{II}$. **Louisiana.**² Beauregard Parish: LA-12 SE of DeQuincy, *S & Su* 10083. East Feliciana Parish: E of Woodland, LA-432 1.5 km E of LA-67, *S & Su* 10113.
- P. oligantha* (Chapm.) Small. $2n = 36$. **Florida.** Franklin Co.: W of St. Teresa, US-319 2.7 km S of Ochlockonee R., *S & Jeff Semple* 10340.
- Solidago altissima* L. var. *altissima*. $2n = 36$. **Texas.**² Grimes Co.: TX-105 1.5 km E of TX-Farm Rd-362, *S & Su* 10069. Harris Co.: N of Bayton, I-10 rest

Table 1. Continued.

- area, *S* & *Su* 10076. Lamar Co.: S of Powderly, US-271 N of Loop Rd-286, *S* & *Su* 10002. $2n = 54$. **Illinois.** Hamilton Co.: IL-142 1 km SE of Dahlgreen, *S* & *Su* 9418. **Kentucky.** Christian Co.: KY-109 SE of Dawson Spring, N end of Pennyrite Forest State Park, *S* & *Su* 9434-1. Harrison Co.: US-62 2 km SW of Clayville, *S* & *Su* 9592. **Louisiana.** Vernon Parish: N of Anacoco, US-171 3.4 km N of LA-111, *S* & *Su* 10046. **Missouri.** Washington Co.: NE of Potosi, MO-21 just N of MO-8, *S*, *Su* & *Ah* 9395. **North Carolina.** Jones Co.: Chadwick, US-17 ca. 5 km NE of Maysville, *S* & *Su* 9753. Pitt Co.: W of Bethel, US-64 0.2 km W of county line, *S* & *Su* 9737. **South Carolina.**² Colleton Co.: NW of Jacksonboro, NC-64 2.5 km from US-17, *S*. & *Su* 9800. **Tennessee.**² Montgomery Co.: US-79 0.5 km S of Kentucky state line, ca. 12 km NE of Clarkville, *S* & *Su* 9437.
- S. arguta* Ait. ssp. *arguta*. $2n = 9_{II}$. **Pennsylvania.** Juniata Co.: 5 km NW of Ickesberg, ridge top, *S* & *Su* 9485.
- S. arguta* Ait. ssp. *caroliniana* (A. Gray) G. Morton. $2n = 9_{II}$. **South Carolina.** Berkeley Co.: SC-45 ca. 5 km E of St. Stephen, Francis Marion Nat'l For., *S* & *Su* 9792. $2n = 18$. **Mississippi.**² Amite Co.: NE of Liberty, Holmes Rd. 6.7 km SE of MS-570, *S* & *Su* 10104. **Missouri.**² Taney Co.: MO-76 11.8 km W of county line, *S* & *Su* 9935. $2n = 36$. **Kentucky.** Adair Co.: NW of Toria, Cumberland Parkway (MP38.1), *S* & *Su* 9444. Laurel Co.: Daniel Boone St. For. junction of For. Rd.-119 and For. Rd-56, *S* & *Su* 9613.
- S. bicolor* L. $2n = 9_{II}$. **Maine.** Sagadahoc Co.: S of Bath, Meadowbrook Rd., woods above The Basin tidal basin, *S* 10377. **Pennsylvania.**² Perry Co.: PA-74 3 km NW of Ickesberg, *S* & *Su* 9487.
- S. caesia* L. $2n = 18$. **Indiana.** Putnam Co.: SE of Cloverdale, IN-42 4.1 km W of US-231, *S* & *Su* 9403. **Kentucky.** Powell Co.: Boone Nat'l For. Tunnel Ridge Rd., *S* & *Su* 9462. **North Carolina.**² Durham Co.: N of Durham, Penny's Bend Nature Reserve, Eno R., *S* & *Su* 9720.
- S. canadensis* L. var. *canadensis*. $2n = 9_{II}$. **Massachusetts.** Plymouth Co.: E of Raynham, MA-104 just S of Lake Nippennicket, *S* 9181.
- S. delicatula* Small. $2n = 18$. **Texas.** Anderson Co.: Co. Rd.-494 0.5 km W of US-287, 3.5 km W of Cayuga, *S* & *Su* 10014.
- S. erecta* Pursh. $2n = 9_{II}$. **New Jersey.** Atlantic Co.: US-40 5.6 km W of Mays Landing, *S* & *Su* 9501. **North Carolina.** Franklin Co.: NC-56 4.2 km W of county line, *S* & *Su* 9735. $2n = 18$. **Kentucky.**² Estill Co.: E of Ravenna, KY-52 by Ravenna-Pryse Rd., *S* & *Su* 9454. Pulaski Co.: KY-1392 ca. 10 km S of Livingston, bluff of Rockcastle R., *S* & *Su* 9605. **Mississippi.**² Itawamba Co.: MS-23 10.1 km N of Tremont, *S* & *Su* 10175.
- S. fistulosa* Mill. $2n = 9_{II}$. **North Carolina.** Martin Co.: US-64 just W of Parmele, *S* & *Su* 9739. $2n = 18$. **Alabama.**² Mobile Co.: N of Theodore, Co. Rd-59 ca. 2 km S of I-10, *S* & *Su* 10128. **Mississippi.**² Harrison Co.: N of D'Iberville, MS-67 N of I-10, *S* & *Su* 10125. **New Jersey.** Atlantic Co.: swampy woods by NJ-50 just S of US-40, *S* & *Su* 9506. **North Carolina.** Jones Co.: Chadwick, US-17 ca. 5 km NE of Maysville, *S* & *Su* 9751. **South Carolina.** Clarendon Co.: US-521 1.1 km SE of Wilson, *S* & *Su* 9785.
- S. flexicaulis* L. $2n = 36$. **Kentucky.** Estill Co.: KY-52 E of Ravenna on Ravenna-Pryse Rd., *S* & *Su* 9453. Menifee Co.: Boone, N.F., KY-715, river bank,

Table 1. Continued.

- S* & *Su* 9464. Pulaski Co.: KY-1392 ca. 10 km S of Livingston, bluff of Rockcastle R., *S* & *Su* 9606.
- S. aff. flexicaulis* L. $2n = 90$.¹ **Kentucky.** Leslie Co.: S of Stinnett, US-421 just S of where highway crosses river, *S* & *Su* 9619. [The plant was tall for the species and the heads were very large.]
- S. gigantea* Ait. $2n = 18$. **Kentucky.**² Leslie Co.: US-421 S of Stinnett, *S* & *Su* 9620. **Mississippi.** Lowndes Co.: Columbus, N end of tow, US-45 S of Chapman Rd., *S* & *Su* 10165. **North Carolina.** Franklin Co.: NC-56 4.2 km W of Nash County line, *S* & *Su* 9732. Washington Co.: E of Skinnerville, US-64 just W of NC-32, *S* & *Su* 9748. **South Carolina.**² McCormick Co.: 4 km N of McCormick, along side rd off SC-28, *S* & *Su* 9819. $2n = 36$. **Illinois.** Kankakee Co.: NW of Bradley, Kankakee R. State Park, *S* & *Su* 9871. White Co.: S of Norris City, junction of IL-1 and US-45, *S* & *Su* 9424. **Missouri.**² Douglas Co.: MO-14 at Twin Bridges (MO-181), woods by N. Fork White R., *S* & *Su* 9928. Hickory Co.: E of Wheatland, US-54 ca. 0.9 km E of Hicomo Picnic Area, *S* & *Su* 9945. $2n = 54$. **Nebraska.**² Hooker Co.: N of Mullen, NE-97 at Middle Loup R., *S*, *Su* & *Ah* 9200.
- S. glomerata* Michx. $2n = 108$. **North Carolina.** Avery Co.: W of Linville, Grandfather Mt., cliff face at top of mt. SW of swing bridge parking lot, *S* & *Su* 9670; ca. 5000 ft. el., *S* & *Su* 9676. Mitchell Co.: top of Roan Mt., Roan High Bluff, 6250 ft. el., *S* & *Su* 9661. Yancey Co.: Mt. Mitchell, near top, ca. 6000 ft. el., *S* & *Su* 9685; midway along rd. to park, mid el., *S* & *Su* 9683.
- S. gracillima* Torr. & Gray. $2n = 9_{II}$. **South Carolina.**² Barnwell Co.: NW of Barnwell, US-278 just N of Salkehatchie R., *S* & *Su* 9814.
- S. hispida* Muhl. $2n = 18$. **Ontario.** Kenora Dist.: Peawanuck, *Clements s.n.*
- S. juncea* Ait. $2n = 18$. **Illinois.**² Jefferson Co.: S of Mt. Vernon, I-64, *S* & *Su* 9414. Effingham Co.: Shelbyville, 2.5 km S of Sigel, *S* & *Su* 9874. **Massachusetts.** Bristol Co.: vicinity of Horseneck Beach Park, *S* 9187. Plymouth Co.: E of Raynham, MA-104 just S of Lake Nippenicket, *S* 9182.
- S. houghtonii* Torr. & Gray. $2n = 9_{II}$. **Ontario.** Bruce Co.: Bruce Peninsula, N of Dyer Bay, alvar below Cabot Head, *S* 10363.
- S. latissimifolia* Mill. $2n = ca. 18_{II}$.¹ **South Carolina.** Chesterfield Co.: US-1 just SW of US-52, *S* & *Su* 9778. $2n = 36$.¹ **Massachusetts.** Plymouth Co.: Center Hill Rd. 2.6 km N of MA-3A, *S* & *Brouillet* 3553. $2n = 27_{II}$.¹ **Rhode Island.** Washington Co.: E of Charleston, W of Matunuck, near W end of Cards Pond Rd., *S* & *Su* 9544. $2n = 54$.¹ **Massachusetts.** Plymouth Co.: W of Manomet, Beaver Dam Rd. 0.9 km S of MA-3A, *S* & *Su* 9568.
- S. leavenworthii* Torr. & Gray. $2n = 36$. **South Carolina.** Allendale Co.: Yeno-me, US-278 S of Barnwell, *S* & *Su* 9807.
- S. lepida* DC. $2n = 18$. **Ontario.**² Kenora Dist.: Peawanuck (S of old Winisk), *Clements s.n.-1*, *Clements s.n.-2*.
- S. ludoviciana* (A. Gray) Small. $2n = 18$. **Texas.**² Fort Bend Co.: TX-36 5 km S of county line, just N of Farm Rd.-1489, *S* & *Su* 10074. $2n = 36$. **Texas.** Grimes Co.: TX-105 2.6 km W of Plantersville, *S* & *Su* 10066. Polk Co.: US-190 E of Livingstone, 1.8 km E of Soda (16.4 km E of TX-146), *S* & *Su* 10058.
- S. missouriensis* Nutt. $2n = 9_{II}$. **South Dakota.** Minnehaha Co.: NW of Hum-

Table 1. Continued.

- boldt, SD-38 3.5 km W of SD-19, *S* & *Xg* 10182. $2n = 18$. **Nebraska.** Lincoln Co.: NE-97 24.2 km SE of Tyron, *S*, *Su* & *Ah* 9195.
- S. mollis* Bartl. var. *mollis*. $2n = 18_{II}$. **South Dakota.** Minnehaha Co.: NW of Humboldt, SD-38 3.5 km W of SD-19, *S* & *Xg* 10181.
- S. nemoralis* Ait. ssp. *decemflora* (DC.) Brammall in Semple. $2n = 18_{II}$. **South Dakota.** Minnehaha Co.: NW of Humboldt, SD-38 3.5 km W of SD-19, *S* & *Xg* 10181.
- S. nemoralis* Ait. ssp. *nemoralis*. $2n = 9_{II}$. **North Carolina.** Chowan Co.: NC-37 just N of Albermarle Sound Causeway, SE of Edenton, *S* & *Su* 9745. Jones Co.: US-17 ca. 5 km NE of Maysville, *S* & *Su* 9750. **South Carolina.** Berkeley Co.: SC-45 ca. 5 km E of St. Stephen, *S* & *Su* 9790. $2n = 18$. **North Carolina.** Guilford Co.: E of Greensborough, service rd. W of Rock Creek Dairy Rd. exit off I-40, *S* & *Su* 9713. $2n = 36$. **Kentucky.** Pulaski Co.: KY-1392 ca. 10 km S of Livingston, bluff of Rockcastle R., *S* & *Su* 9609.
- S. nitida* Torr. & Gray. $2n = 18$. **Louisiana.** Vernon Parish: N of Anacoco, US-171 3.4 km N of LA-111, *S* & *Su* 10045.
- S. odora* Ait. var. *odora*. $2n = 9_{II}$. **Louisiana.**² Webster Parish. LA-159 8.4 km S of Leton (LA-2), *S* & *Su* 10034. **Massachusetts.** Bristol Co.: vicinity of Horseneck Beach Park, *S* 9186. **New Jersey.**² Salem Co.: W of Malaga, NJ-55, *S* & *Su* 9499. **South Carolina.**² Colleton Co.: NW of Jacksonboro, NC-64 ca. 2.5 km from US-17, *S* & *Su* 9798. $2n = 18$. **Kentucky.**² Powell Co.: Boone Nat'l For., end of Tunnel Ridge Rd., *S* & *Su* 9460. **Texas.**² Newton Co.: NE of Burkeville, TX-63 2.5 km W of Sabine R., *S* & *Su* 10050.
- S. patula* Muhl. ex Willd. var. *patula*. $2n = 9_{II}$. **New York.** Steuben Co.: W of Bath, county rd., *S* & *Su* 9473. $2n = 18$. **North Carolina.** Mitchell Co.: top of Roan Mt., *S* & *Su* 9655. Yancey Co.: Mt. Mitchell, midway along rd. to park, *S* & *Su* 9686.
- S. patula* Muhl. ex Willd. var. *strictula* Torr. & Gray.¹ $2n = 9_{II}$. **Mississippi.** Harrison Co.: US-46 12 km N of Lyman, *S* & *Su* 10123.
- S. puberula* Nutt. var. *puberula*. $2n = 9_{II}$. **Maine.** Sagadahoc Co.: S of Bath, Meadowbrook Rd., woods above The Basin tidal basin, *S* 10376. York Co.: NW of Kennebunk, ME-35 1.1 km S of ME-111, Lyman, *S* & *Su* 9586.
- S. puberula* Nutt. var. *pulverulenta* (Nutt.) Chapm. $2n = 9_{II}$. **North Carolina.**² Bladen Co.: 0.5 km SW of Carvers, *S* & *Su* 9771. **South Carolina.**² Barnwell Co.: NW of Barnwell, US-278 just N of Salkehatchie R., *S* & *Su* 9813.
- S. pulchra* Small.¹ $2n = 18_{II}$. **North Carolina.** Brunswick Co.: NC-133 S of Orton Plantation, *S* & *Su* 9765. Onslow Co.: US-17 1.7 km N of Dixon (NC-210), *S* & *Su* 9755. Pender Co.: Hampstead, NC-210 ca. 4.1 km W of US-17, *S* & *Su* 9760.
- S. radula* Nutt. $2n = 18$. **Louisiana.** Natchitoches Parish: E of Ajax, LA-174 1.5 km SE of co. line, *S* & *Su* 10038. **Missouri.**² Washington Co.: MO-8 6.6 km W of Potosi, *S*, *Su* & *Ah* 9388.
- S. rigida* L. var. *glabrata* (Braun) Heard & Semple. $2n = 9_{II}$. **Texas.** Dallas Co.: N of Cedar Hill, Cedar Hill Rd., opposite lot 1110, RR right-of-way, *S* & *Su* 10007.
- S. rigida* L. var. *humilis* (Porter) Heard & Semple. $2n = 18$. **Illinois.** St. Clair

Table 1. Continued.

- Co.: Fairview Heights, Community Park, *S* & *Su* 9413. **Nebraska.** Hooker Co.: N of Mullen, NE-97 by Middle Loup R., *S*, *Su* & *Ah* 9198.
- S. rupestris* Raf. $2n = 36$. **Kentucky.**² Robertson Co.: KY-617 0.5 km W of Piqua, banks of Blue Lick R., *S* & *Su* 9594.
- S. sempervirens* L. var. *mexicana* (L.) Fern. $2n = 9_{II}$. **North Carolina.** Beaufort Co.: S of Washington, just S of Pamlico R., *S* & *Su* 9749. $2n = 18$. **Florida.** Walton Co.: Freeport, US-331 just N of FL-20, *S* & *Su* 10133.
- S. sempervirens* L. var. *sempervirens*. $2n = 18$. **Massachusetts.** Bristol Co.: Somerset, N of town along Segreganset Estuary, *S* 9184.
- S. shortii* Torr. & Gray. $2n = 18$. **Kentucky.** Flemming Co.: S of town of Bluelicks, S banks of Bluelicks R., *S* & *Su* 9598.
- S. speciosa* Nutt. var. *speciosa*. $2n = 18_{II}$. **South Carolina.**² Edgefield Co.: SC-230 17 km N of county line, *S* & *Su* 9817.
- S. sphacelata* Raf. $2n = 18$. **North Carolina.** Mitchell Co.: W of Bakersville, NC-226 1.5 km W of NC-80, *S* & *Su* 9649.
- S. stricta* Ait. $2n = 9_{II}$. **North Carolina.**² Brunswick Co.: NC-133 W of Wilmington, *S* & *Su* 9763. $2n = 18$. **South Carolina.** Clarendon Co.: US-521 1.1 km SE of Wilson, *S* & *Su* 9786. Hampton Co.: US-601 22.4 km S of Hampton, *S* & *Su* 9803. $2n = 36$. **Louisiana.**² St. Tammany Parish: E of LaCombe, US-191 2.4 km E of LA-434, *S* & *Su* 10118. **South Carolina.**² Colleton Co.: NW of Jacksonboro, NC-64 8.7 km from US-17, *S* & *Su* 9801. **Texas.**² Austin Co.: TX-36 4.2 km N of Sealy (Farm Rd.-1094), *S* & *Su* 10071. Harrison Co.: N of Baytown, vicinity of N. Maine St. exit off I-10, *S* & *Su* 10080. Orange Co.: NE of Vidor, TX-12 ca. 3 km NE of I-10, *S* & *Su* 10079. $2n = 54$. **Florida.** Bay Co.: E of Ebro, FL-20 3 km E of FL-79, *S* & *Su* 10138. Walton Co.: FL-20 3.2 km E of Freeport (US-331N), *S* & *Su* 10134. **North Carolina.**² NNW of Supply, NC-211 13.4 km SSE of Columbus Co. line, *S* & *Su* 9766. **South Carolina.** Berkeley Co.: NC-17 9.2 km SE of Jamestown (US-17alt.), *S* & *Su* 9796. Jasper Co.: NW of Ridgeland, SC-652 14.9 km SE of Pineland, *S* & *Su* 9805.
- S. tortifolia* Ell. $2n = 18$. **Louisiana.**² Sabine Parish: N of Many, LA-175 10.7 km N of US-171, *S* & *Su* 10040. **South Carolina.** Berkeley Co.: SC-45 ca. 5 km E of St. Stephen, Francis Marion Nat'l For., *S* & *Su* 9789.
- S. uliginosa* Nutt. $2n = 18_{II}$. **Maine.**² York Co.: Wells Beach, W of beach front, *S* & *Su* 9590. **Massachusetts.** Essex Co.: N of Newbury, 1.5 km W of Plum Is. R., opposite airport, *S* & *Su* 9576. **New Jersey.**² Ocean Co.: Tuckerton, coastal cedar marsh E of town centre, *S* & *Su* 9524. **Rhode Island.**² Washington Co.: S of Indian Lake Shores, US-1 4.9 km S of RI-138W, *S* & *Su* 9545.
- S. ulmifolia* Muhl. ex Willd. $2n = 18$. **Arkansas.** Crawford Co.: US-71 5.8 km S of county line, *S* & *Su* 9964. Washington Co.: S of Fayetteville, US-71 just S of AR-170, *S* & *Su* 9957. **Illinois.** Kankakee Co.: NW of Bradley, Kankakee R. State Park, by Rocky R., *S* & *Su* 9870. Union Co.: Bald Knob Rd. N of Bald Knob, *S* & *Su* 9880, *S* & *Su* 9881. White Co.: S of Norris City, IL-1 1.78 mi N of county line, *S* & *Su* 9426. **Missouri.** Carter Co.: approx. between Van Buren and Hunter, gravel extension of MO-T 7.8 km SW of US-60, *S* & *Su* 9906. Douglas Co.: MO-14 at Twin Bridges, woods by N. Fork of

Table 1. Continued.

- White R., near MO-181, *S* & *Su* 9930. Hickory Co.: MO-64B W of Pittsburg, *S* & *Su* 9940. Oregon Co.: N of Greer, MO-19 16.6 km S of US-60, vicinity of Mark Twain Nat'l For. Rd.-3174, *S* & *Su* 9918, *S* & *Su* 9919, *S* & *Su* 9920. Phelps Co.: S of Jerome, Co. Rd.-D at I-44 exit, *S*, *Su* & *Ah* 9385. Taney Co.: MO-76 11.8 km W of county line, *S* & *Su* 9934. Washington Co.: MO-8 6.6 km W of Potosi, *S*, *Su* & *Ah* 9389. Wayne Co.: Co. Rd.-F 0.1 km E of US-67 7.8 km S of Greenville, *S* & *Su* 9893; NE of Wappapello, MO-2 a few km NE of MO-D, *S* & *Su* 9886; E of Williamsville, MO-49 2.5 km E of Co. Rd.-A, *S* & *Su* 9900.
- Virgulus ericoides* (L.) Reveal & Keener var. *ericoides*. $2n = 10$. **Illinois.** St. Clair Co.: Fairview Heights, Community Park, bluff of Mississippi R., *S* & *Su* 9408. **Texas.** Grimes Co.: E of Navasota, TX-105 1.5 km E of Farm Rd.-362, *S* & *Su* 10067. $2n = 10$. **Texas.** Dallas Co.: N of Cedar Hill, area opposite 1110 Cedar Hill Rd., *S* & *Su* 10006. $2n = 10 + 0-3$ supernumeraries. **Texas.** Lamar Co.: S of Powderly, US-271 N of Paris, *S* & *Su* 10001.
- V. oblongifolius* (Nutt.) Reveal & Keener. $2n = 10$. **Nebraska.** Hooker Co.: N of Mullen, bluff of Middle Loop R., just E of NE-97, *S*, *Su* & *Ah* 9197. $2n = 20$. **Arkansas.** Logan Co.: Magazine Mt., top of Cameron Bluff, *S* & *Su* 9970. **Missouri.** Oregon Co.: N of Greer, MO-19 just N of For. Rd.-3188 and Eleven Point R., limestone bluff glade, *S* & *Su* 9921. Washington Co.: MO-21 NE of Potosi, just N of MO-8, *S*, *Su* & *Ah* 9398; MO-8 6.6 km W of Potosi, *S*, *Su* & *Ah* 9394.
- V. patens* (Soland. in Ait.) Reveal & Keener var. *gracilis* (Hook.) Reveal & Keener. $2n = 5_{II}$. **Texas.** Harrison Co.: NE of Marshall, TX-43 7.2 km NE of US-59, *S* & *Su* 10025.
- V. patens* (Soland. in Ait.) Reveal & Keener var. *patens*. $2n = 20$. **Texas.** Fort Bend Co.: N of Orchard, TX-36 5 km S of county line, N of Farm Rd.-1489, *S* & *Su* 10073.
- V. patens* (Soland. in Ait.) Reveal & Keener var. *patentissimus* (Torr. & Gray) Reveal & Keener. $2n = 20$. **Missouri.** Bollinger Co.: 1.2 km W of Arab, *S* & *Su* 9885.
- V. patens* (Soland. in Ait.) Reveal & Keener var. *phlogifolius* (Muhl.) Reveal & Keener. $2n = 20$. **Illinois.**² Hamilton Co.: 7.5 km E of McLeansboro at Co. Rd.-1400E, *S* & *Su* 9421. **Kentucky.** Pulaski Co.: KY-461 7 km NE of Shopville, *S* & *Su* 9451.

sachusetts; *S. patula* Muhl. ex. Willd. var. *strictula* Torr. & Gray, $2n = 9_{II}$ (one population) from Mississippi; and *S. pulchra* Small, $2n = 18_{II}$ (3 populations) from North Carolina. Many of the counts (99) represent the first report(s) for a taxon, or ploidy level of a taxon, for a particular province or state, based on data compiled on nearly 7000 chromosome number reports of North American asters and goldenrods (Semple, 1992): e.g., *Aster puniceus* L. ($2n = 16$) from Georgia, *Heterotheca camporum* (Greene) Shinnars

Table 2. Summary of chromosome number reports by genus by area. The numbers of counts representing first report(s) of a taxon, or ploidy level within a taxon, for each region are given as subscripts.

Region	Total	<i>Aster</i>	<i>Virgulus</i>	<i>Euthamia</i>	<i>Solidago</i>	Other Genera
Canada						
Ontario	9	5	—	—	3 ₁	1
United States						
Alabama	6	4 ₄	—	—	1 ₁	1 ₁
Arkansas	11	7 ₄	1	—	2	1
Connecticut	1	1 ₁	—	—	—	—
Florida	5	1	—	—	3	1
Georgia	2	2 ₁	—	—	—	—
Illinois	25	11	2 ₁	—	10 ₂	2
Indiana	3	2	—	—	1	—
Kentucky	37	20 ₆	1	—	16 ₆	—
Louisiana	14	6 ₅	—	—	6 ₃	2 ₁
Maine	8	4	—	—	4 ₁	—
Massachusetts	15	6 ₁	—	—	8 ₂	1
Minnesota	2	2	—	—	—	—
Mississippi	11	6 ₁	—	—	5 ₄	—
Missouri	35	13 ₄	4	—	17 ₂	1 ₁
Nebraska	4	—	1	—	3 ₁	—
New Jersey	11	5 ₂	—	—	4 ₂	2 ₁
New York	1	—	—	—	1	—
North Carolina	49	15 ₁	—	—	26 ₇	7 ₁
Oklahoma	6	6 ₃	—	—	—	—
Pennsylvania	3	1 ₁	—	—	2 ₁	—
Rhode Island	2	—	—	—	2 ₂	—
South Carolina	25	5 ₁	—	1	17 ₇	2 ₁
South Dakota	3	—	—	—	3	—
Tennessee	7	6 ₂	—	—	1 ₁	—
Texas	36	12 ₄	4	3	12 ₈	4
Wisconsin	1	1	—	—	—	—
TOTALS	333₆₁	142₄₁	14₁	5	147₅₁	25₆

var. *glandulissimum* Semple ($2n = 36$) from Alabama, *Solidago lepida* DC. ($2n = 18$) from Ontario, *S. flexicaulis* L. ($2n = 90$) from Kentucky, *S. fistulosa* Mill. ($2n = 18$) from Alabama, *S. odora* Ait. var. *odora* ($2n = 9_{II}$) from New Jersey and *S. puberula* Nutt. var. *pulverulenta* (Nutt.) Chapm. ($2n = 9_{II}$) from South Carolina. The number of reports and the number of first reports for each province and state are summarized in Table 2 and each case is identified in Table 1. First reports are listed for the fol-

lowing political regions: Alabama, Arkansas, Connecticut, Georgia, Illinois, Kentucky, Louisiana, Maine, Massachusetts, Mississippi, Missouri, Nebraska, New Jersey, North Carolina, Oklahoma, Ontario, Pennsylvania, Rhode Island, South Carolina, Tennessee and Texas.

ASTER PILOSUS COMPLEX

The *Aster pilosus* Willd. complex includes all of the eastern North American members of *Aster* sect. *Dumosi* Torr. & Gray subsect. *Porteriani* (Rydb.) Semple: *A. depauperatus* (Porter) Fern., *A. parviceps* (Burgess) Mackenzie & Bush, *A. pilosus* var. *pilosus*, *A. pilosus* var. *pringlei* (A. Gray) Blake, and *A. priceae* Britt. Included in Table 1 are 14 counts representing all eastern members of the complex, whose cytogeography was examined in some detail earlier by Semple and Chmielewski (1985). Special note should be taken of the counts for four collections from Missouri hesitantly treated in Table 1 as *A. aff. parviceps* and *A. aff. pilosus* var. *pringlei*. One specimen (Semple et al. 9398) was tetraploid ($2n = 32$) and was from a cedar glade habitat; three collections were hexaploid ($2n = 48$) and also were from cedar glades. The specimens were glabrous to very sparsely pubescent, which is atypical for *A. parviceps*. Some of the glabrous hexaploid individuals were very similar in growth form and general appearance to the octoploid *A. priceae* (Semple et al., 1989), which is endemic to a small region in southern Kentucky (Table 1, Semple & Suropto 9438 & 9440-1), central Tennessee and northern Alabama and Georgia, but the Missouri plants had white rays rather than the blue usual for *A. priceae* along with smaller heads and floral parts. Other individuals from the same cedar glades were slightly pubescent. The hexaploid level and glabrous condition is typical of *A. pilosus* var. *pringlei*, which is not previously reported for the Ozark region. Tetraploids are unknown in var. *pringlei*. Thus, the four collections from Missouri do not fit well into any of the three taxa to which they might be assigned. They cannot be hybrids between *A. pilosus* and another species in a different section or subsection because they have phyllaries and lower stem and rosette leaves typical of the subsection; these traits are modified in hybrids. Following Steyermark (1963), the collections could be assigned to *A. pilosus* var. *demotus* Blake, but the type of this

taxon is just a robust var. *pringlei* from southeastern Virginia (Semple and Chmielewski, 1985). If the collections are determined to be more correctly assigned to *A. pilosus* var. *pringlei* than to *A. parviceps*, then the range of the former must be expanded to include disjunct populations in the northern Ozarks, and one of these would be the only known tetraploid member of the variety. A more definitive way of distinguishing members of the complex is needed than the usual approach based on head and floret size and the degree of upper stem pubescence, because these break down in the case of these glabrous-glabrate Missouri plants. The circumscription of either *A. parviceps*, *A. pilosus* var. *pringlei* or *A. priceae* will have to be modified to accommodate these cedar glade individuals. A detailed multivariate morphometric analysis is being undertaken to resolve the problem.

SOLIDAGO STRICTA COMPLEX

The *Solidago stricta* complex in the southeastern United States includes *S. austrina* Small, *S. flavovirens* Chapm., *S. gracillima* Torr. & Gray, *S. perlonga* Fern., *S. pulchra* Small, and *S. stricta* Ait. Cronquist (1980) distinguished individual species on the basis of rhizome, capitulescence and capitulum traits. *Solidago stricta* was distinguished by its elongate, stoloniferous rhizomes, which are lacking in *S. pulchra* and *S. gracillima* (including *S. austrina*, *S. flavovirens*, and *S. perlonga*). *Solidago pulchra* and *S. gracillima* were distinguished on the basis of stem height, the number of heads, and the number of florets per head; the widely distributed *S. gracillima* was tall with few florets per head, and the narrowly distributed *S. pulchra* was short with a few heads with many florets per head. Radford et al. (1968) treated the complex differently, merging *S. austrina* and *S. pulchra* into *S. stricta*, and they noted that the rare, narrowly distributed *S. gracillima* with more widely spreading capitulescence branches might be conspecific with *S. stricta*.

Three diploid, two tetraploid and three hexaploid reports ($2n = 18$, $2n = 36$, and $2n = 54$, respectively) have been published previously for members of the complex (Beaudry, 1963; Semple et al., 1981, 1984). With the addition of 17 counts for members of the complex reported here in Table 1, a tentative geographic pattern can be recognized now in *S. stricta*. *Solidago stricta* was

found to be diploid in North and South Carolina, tetraploid in South Carolina, Florida, Louisiana and Texas, and hexaploid in New Jersey, North and South Carolina, and Florida. Thus, the western portion of the range (in the United States at least) is apparently occupied only by tetraploids, but from the Florida Panhandle northward all three ploidy levels may be encountered, with the hexaploid level being most frequently reported to date.

Only a few counts have been reported for other members of the complex. For *Solidago austrina*, there is one diploid report (North Carolina, Beaudry, 1963) and one hexaploid report published as "*S. stricta* (= *S. austrina*)" (North Carolina, Semple et al., 1984). The latter is probably just *S. stricta*, not *S. austrina*. Two diploid reports are known for *S. gracillima* (Alabama, Beaudry, 1963; South Carolina, Table 1 here).

Solidago pulchra (*sensu* Cronquist) is known from only a few coastal counties in North and South Carolina and was previously unknown cytologically. It was found to be tetraploid ($2n = 18_{II}$) at three populations in separate counties in North Carolina (Table 1). Our plants were clearly different from any of the *S. stricta* collections, being much shorter, having heads with a campanulate-hemispherical versus cylindrical shaped involucre and bright yellow versus yellow-green phyllaries, and more ray and disc florets per head. Differences in habitat preference may also exist, but a number of our collections came from disturbed areas whose original character was unclear; additional data are needed to clarify this distinction.

Because stem height in goldenrods is a very plastic trait and because ploidy level is known to influence involucre height and the numbers of florets per head (Beaudry and Chabot, 1957; Beaudry et al., 1958; Beaudry, 1960, 1970; Melville and Morton, 1982; Heard and Semple, 1988; Semple et al., 1990), separating taxa in the *S. stricta* complex on the basis of these traits may not lead to a useful classification. It is clear from the chromosome counts now reported that at least one of the taxa in the complex includes more than one ploidy level and that diploids in all the taxa occur on the coastal plain in the Carolinas. A detailed cytogeographic and multivariate morphometric analysis of the complex is needed to determine the distribution of cytotypes throughout the range of each taxon and to determine how many of these taxa warrant recognition.

SOLIDAGO ULIGINOSA

The cytogeography of *Solidago uliginosa* was examined by Chmielewski et al. (1987), who reviewed previous reports (Beaudry et al., 1958; Beaudry and Chabot, 1959; Beaudry, 1969; Kapoor, 1970, 1977; Morton, 1981; Semple, 1981; Semple et al., 1981, 1984; Löve and Löve, 1982; Chmielewski, 1985). In those studies, diploids were common across the range of the species in eastern Canada and the northeastern United States. In contrast, tetraploids were reported from several disjunct areas: limestone pavements around northern Lake Huron in Ontario (five sites) and northern Lake Michigan in Michigan (two sites), near James Bay in northwestern Québec (Beaudry, 1969; one site), west of Montréal in southern Québec (Beaudry, 1969; one site) and the northeastern United States (Beaudry and Chabot, 1959; one site each in eastern Massachusetts and southeastern Pennsylvania; Beaudry, 1963; one site each in central Massachusetts and northern West Virginia). Since 1988 two additional diploid counts have been reported (Semple et al., 1989). To these previous reports we add four tetraploid counts here (Table 1; one each from near the coast in New Jersey, Rhode Island, Massachusetts, and Maine). To date, all counts from the southeastern portion of the species's range are tetraploid. Thus, tetraploids are the dominant cytotype in two disjunct areas (one east and one west of the Appalachian Mountains) and occur rarely in several other parts of the range. Diploids are unknown in the southeastern portion of the range of the species.

ACKNOWLEDGMENTS

This work was supported by Natural Sciences and Engineering Research Council of Canada Operating Grants to Semple. We thank the following people for their assistance in the field: Tufail Ahmed, Jerry Chmielewski, Jeff Semple and Bambang Agus Suripto. Viable rootstocks provided by Blair Clements from near Hudson Bay in northern Ontario were very much appreciated.

LITERATURE CITED

- BEAUDRY, J. R. 1960. Studies on *Solidago* L. V. The *Solidago rugosa* complex. *Canad. J. Genet. Cytol.* 2: 389–396.

- . 1963. Studies on *Solidago* L. VI. Additional chromosome numbers of taxa of the genus *Solidago*. *Canad. J. Genet. Cytol.* 5: 150–174.
- . 1969. Études sur les *Solidago* IX. Une Troisième liste de nombres chromosomiques des taxons du genre *Solidago* et de certains genres voisins. *Naturaliste Canad.* 97: 431–445.
- . 1970. Études sur les *Solidago*. X. Le *Solidago gigantea* Ait. dans l'est de l'Amérique du Nord. *Naturaliste Canad.* 97: 35–42.
- AND D. L. CHABOT. 1957. Studies on *Solidago* L.—I. *S. altissima* L. and *S. canadensis* L. *Contrib. Inst. Bot. Univ. Montreal.* 70: 65–72.
- AND ———. 1959. Studies on *Solidago* IV. The chromosome numbers of certain taxa of the genus *Solidago*. *Canad. J. Bot.* 37: 209–288.
- , A. ZINGER AND J. SAINT-PIERRE. 1958. Études sur la genre *Solidago* L. II. la mise en évidence de la polyploïdie endotaxonomique chez *S. purshii* Porter et les taxa similaires. *Canad. J. Bot.* 36: 663–670.
- CHMIELEWSKI, J. G. 1985. Documented plant chromosome numbers 1985: 1. Miscellaneous counts from Ontario and Quebec. *SIDA* 1: 251–253.
- , R. S. RINGIUS AND J. C. SEMPLE. 1987. The cytogeography of *Solidago uliginosa* Nutt. (Compositae: Astereae) in the Great Lakes region. *Canad. J. Bot.* 65: 1045–1046.
- CRONQUIST, A. 1980. Vascular Flora of the Southeastern United States. I. Asteraceae. Univ. North Carolina Press, Chapel Hill, NC.
- HEARD, S. B. AND J. C. SEMPLE. 1988. The *Solidago rigida* complex (Compositae: Astereae): a multivariate morphometric analysis and chromosome numbers. *Canad. J. Bot.* 66: 1800–1807.
- KAPOOR, B. M. 1970. In IOPB chromosome number reports XXVII. *Taxon* 19: 437–442.
- . 1977. Further observations on the morphology of some *Solidago* species. *Cytologia* 42: 241–253.
- LÖVE, A. AND D. LÖVE. 1982. In IOPB chromosome number reports. LXXV. *Taxon* 31: 344–360.
- MELVILLE, M. R. AND J. K. MORTON. 1982. A biosystematic study of the *Solidago canadensis* (Compositae) complex. I. The Ontario populations. *Canad. J. Bot.* 60: 976–997.
- MORTON, J. K. 1981. Chromosome numbers in Compositae from Canada and the U.S.A. *Bot. J. Linn. Soc.* 82: 357–368.
- RADFORD, A. E., H. E. AHLES AND C. R. BELL. 1968. Manual of the Vascular Flora of the Carolinas. University of North Carolina Press, Chapel Hill, NC.
- SEMPLÉ, J. C. 1981. Misc. chromosome counts. In Chromosome number reports LXXII. *Taxon* 30: 703–704.
- . 1985. Chromosome number determinations in Fam. Compositae, Tribe Astereae. *Rhodora* 87: 517–527.
- . 1992. A geographic summary of chromosome number reports for North American asters and goldenrods (Compositae: Astereae). *Ann. Missouri Bot. Garden* 79: 95–109.
- , R. A. BRAMMALL AND J. G. CHMIELEWSKI. 1981. Chromosome numbers of goldenrods, *Euthamia* and *Solidago*, (Compositae-Astereae). *Canad. J. Bot.* 59: 1167–1173.
- AND J. G. CHMIELEWSKI. 1985. The cytogeography of *Aster pilosus* (Com-

- positae-Astereae). II. Survey of the range, with notes on *A. depauperatus*, *A. parviceps* and *A. porteri*. *Rhodora* 87: 367–379.
- AND ———. 1987. Chromosome numbers in Fam. Compositae, Tribe Astereae. II. Additional counts. *Rhodora* 89: 319–325.
- , J. G. CHMIELEWSKI AND R. A. BRAMMALL. 1990. A multivariate study of *Solidago nemoralis* (Compositae: Astereae) and comparison with *S. californica* and *S. sparsiflora*. *Canad. J. Bot.* 68: 2070–2082.
- , ——— AND CHUNSHENG XIANG. 1992. Chromosome numbers in Fam. Compositae, Tribe Astereae. IV. Additional reports and comments on the cytogeography and status of some species of *Aster* and *Solidago*. *Rhodora* 94: 48–62.
- , ——— AND M. A. LANE. 1989. Chromosome numbers in Fam. Compositae, Tribe Astereae. III. Additional counts and comments on generic limits and ancestral base numbers. *Rhodora* 91: 296–314.
- , G. RINGIUS, C. LEEDER AND G. MORTON. 1984. Chromosome numbers of goldenrods, *Euthamia* and *Solidago* (Compositae-Astereae). II. Additional counts with comments on cytogeography. *Brittonia* 36: 280–292.
- STEYERMARK, J. A. 1963. *Flora of Missouri*. Iowa State University Press, Ames, IA.

DEPARTMENT OF BIOLOGY
UNIVERSITY OF WATERLOO
WATERLOO, ONTARIO, CANADA N2L 3G1